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Providing Antenatal Care Facility is the Most Effective Way to Improve Nutritional Knowledge of Mothers Working in the Ready-Made Garment Industry of Bangladesh

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A B S T R A C T

Mothers perform the social responsibility of providing food and caring the family members throughout the world and the type of food and care they provide depend to a large extent on their knowledge of basic nutrition and health care. Mothers' limited knowledge about food choices, feeding, and health care may contribute significantly to adverse nutrition outcomes. More than 2.5 million of the ready-made garment (RMG) workers of Bangladesh face severe time and resource constraints, where socio-cultural beliefs and mothers' perceptions also strongly influence food habits. Therefore, this research is an attempt to discover how to enhance their nutritional knowledge. A cross-sectional study design has been used and primary data were collected following a systematic random sampling technique from 169 ever-married women RMG workers who accompany at least one biological child aged between 6 to 59 months. To explore the sources of mothers' nutrition knowledge, Robust Poisson Regression (RPR) model has been used. The study found that the mothers working in the RMG industry have a low to medium level of nutritional knowledge and their level of knowledge is significantly influenced by their educational qualification, receiving antenatal care, and their movement from different places. As the scope of increasing educational qualification and also their movement is limited due to time constraint, nutritional counseling from doctors and health workers would be the best option for these large number of female labors. Therefore, relevant authorities should give importance on facilitating antenatal care and nutritional counseling to increase their knowledge.

Introduction

Throughout the world, mothers are performing a cultural responsibility of providing food at household level where they need to assure nutrition of the children, the other family members as well as for themselves. They are the primary caregivers especially for the infants and the children. The type of food and care she provides depends to a large extent on her knowledge of basic nutrition and health care (Yabancı *et al.*, 2014). Without adequate knowledge about food choices, feeding, and health care seeking practices, malnutrition and poor nutritional status can occur in households with sufficient income, food and health services (FAO, 2013) and a family may suffer greatly in many ways (Berra, 2014; Daba *et al.*, 2013; Langi *et al.*, 2008; Fadare *et*

al., 2019). It is estimated that over 200 million children in developing countries do not reach their full potential in cognitive, language and socio-emotional development, because of nutritional deficiencies, inappropriate feeding practices, and inadequate learning opportunities (Lake, 2011; Kaleem *et al.*, 2018; Dietz, 2020). Lower maternal nutrition knowledge and less healthy eating habits have been found to be more prevalent among socio-economically disadvantaged women (Beydoun & Wang, 2008; Giskes *et al.*, 2022; Lallukka *et al.*, 2007; Turrell & Kavanagh, 2006; Reed *et al.*, 1996; Ruel *et al.*, 1992).

Ready-made garment (RMG) industry is the largest employing sector after agriculture in the economy and in terms of formal employment, it employs the highest number

of women workers in Bangladesh. It is estimated that about 4.22 million workers are employed in this sector, among them, 59% were women of which 74% are married and around 8.3% of the female workers give birth to a child in a year (Haque and Bari, 2021). United Nations Children's Fund (UNICEF, 2015) found that most of the RMG workers have migrated from rural to urban areas due to facing poverty who could not afford to continue studying. Haque *et al.*, (2022) found that majority of the RMG workers do not accompany their children and those who attend, about 38% of them are severely or moderately stunted, while 44% mothers have poor child nutrition knowledge, and about 90% of the workers visited doctors or health clinic during pregnancy for receiving ANC services only when they face any emergency situation. They also found that mothers leave their children to the relative or non-relative caregivers when they go out for work. They work for more than 8 hours per day and are poorly paid (ranges between $100 - $160 monthly) compared to the cost of their essential needs (Tania, 2019). Several studies also have shown that poverty does not necessarily result in malnourished children, even in the midst of poverty, some mothers successfully raise well-nourished children if they have proper nutrition knowledge (Berggren & Wray, 2002; Mackintosh, Marsh and Schroeder, 2002).

There are many evidences that mothers' nutrition knowledge directly impacts both their children's and their own diet and nutrition (Omaghomi *et al.*, 2016; Asiimwe *et al.*, 2021; Ruel *et al.*, 1992; Ruel *et al.*, 1999; Smith *et al.*, 2010; Edith & Priya, 2016; Vereecken & Maes, 2010; Yung *et al.*, 2009; Williams *et al.*, 2012; Worsley, 2002). Some studies assumed that improvements in mothers' nutritional knowledge are most beneficial for young children (Black *et al.*, 2013; Leroy *et al.*, 2014; Ruel *et al.*, 2008; Kaleem *et al.*, 2018; Shapu *et al.*, 2020, Howerton *et al.*, 2007; McAleese & Rankin, 2007), while some others have shown no such relationship (Walia and Gambhir, 1975; Grant and Stone, 1986).

Nutritional knowledge may be achieved from several sources including formal education, family members, friends, mass media and community health services (Glewwe, 1999). The knowledge obtained from formal education and community health services may be to a large extent scientific, while knowledge obtained through friends and families may be related to the culture, tradition and beliefs in the community (Gittelsohn and Vastine, 2003). As a significant portion of socio-economically disadvantaged mothers working in this sector have the children of under 5 years and they have to provide food and care for the children and other family members as well as for themselves with an unimaginable busy schedule, their increased nutrition knowledge may improve the nutritional status of the entire household. But it is not clear what would be the sources of nutrition knowledge, when they did not have good educational background, and not even have enough time to visit health professionals or speak with anyone so that they may increase level of their nutritional knowledge. Therefore, the study is aimed at to find the ways of enhancing nutritional knowledge of mothers working in the RMG industry.

Methodology
Sources of data
A cross-sectional study design has been used and primary data obtained from the direct field survey, conducted in Gazipur district between June and September 2020, focusing on women in the RMG sector. Almost 60% of RMG factories are in Dhaka and Gazipur district in Bangladesh (Moazzem and Radia, 2016). A systematic random sampling technique was followed and considering 12% population, data were collected from 169 ever-married women RMG workers who have at least one biological child aged between 6 to 59 months.
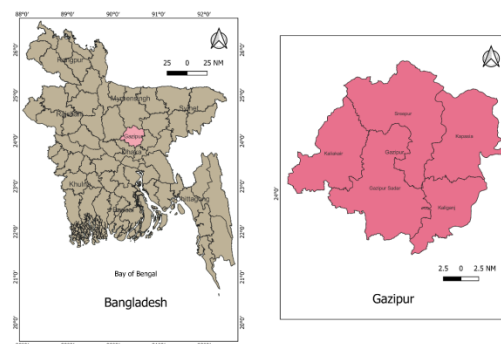

Figure 1. Map of the study area.

Nature of dependent and explanatory variables
Six nutrition related questions were asked to evaluate mothers' nutrition knowledge. All the answers were in binary (yes = 1/ no = 0) format and summed up into one composite score ranges between 0 to 6 discrete scale. The scale was used as an index of mothers' nutrition knowledge as well as dependent variable of the study.

The study used several explanatory variables. Mothers' age was used as continuous variable. Mothers' education has been classified into four categories; no education; up to primary; up to secondary; higher secondary and more. Presence of elderly member, receiving ante-natal care (ANC), mothers' mobility, exposure to media and membership of any group were chosen as dichotomous variables.

Analytical method
Descriptive statistics has been performed to explore the nature and distribution of both dependent and independent variables. Several statistics like mean, frequency, percentage, minimum and maximum, histogram was estimated for modeled variables. The nature of the dependent variable is the number of scores earn by the mothers in 0 to 6 scale which is discrete count variable. To explore the factors affecting mothers' nutrition knowledge, Robust Poisson Regression (RPR) model has been used as it is proposed for the inference about regression parameters for more general count data, so that concern about the correctness of the Poisson assumption (Tsou, 2006). Poison regression is usually used for count dependent variable (Coxe *et al.*, 2009). The poison regression model is written as follow:

$$\Pr(Y_i = y_i | \mu_i, t_i) = \frac{e^{-\mu_i t_i}(\mu_i, t_i)^{y_i}}{y_i!}$$

where,

$$\mu_i = t_i \mu(x_i'\beta)$$
$$= t_i \exp(\beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki})$$

The poison incidence rate μ_i is determined by a set of k regressor (X's variables) and β's are the unknown parameters estimated from the data. In post estimation section, goodness of fit test has also been performed to investigate whether the data follow the distributional assumption or not (Pyne, 1979). A link test was then performed to determine whether the regression model is correctly specified or not. It looks for a specific types of

error occurred from mis-specification whether the dependent variable need to be transformed or not for precisely relate with independent variables (Pregibon, 1980). The test adds the squared exploratory variable to the model and tests for significance versus the non-squared model. All the analysis has been done by STATA 17.0 statistical software package.

Results

Socio-economic Features of the Respondents

To estimate the mothers' nutrition knowledge, six specific questions were asked to the mothers and responses were recorded carefully. Two questions were answered by more than 80% mothers about feeding colostrum is important for the new born and providing oral saline when anyone suffers from diarrhea. More than three fourth (79%) of RMG working mothers know that they should introduce semi solid food to the child's diet when the child becomes 6 months old. More than half of the mothers know that they should consume diverse food. But a very few (14%) mothers know that eating fast foods/ industrial foods/ snacks (restaurants) is not healthy at all. Only 11% of the RMG working mothers know that a baby can be a healthy even s/he is not fat (Table 1).

Table 1. Assessment of mothers' nutrition knowledge.

Variables	No (%)	Yes (%)
Do you think that a baby can be healthy even if s/he is not fat?	150 (88.76)	19 (11.24)
Do you think that feeding colostrum's to a baby is important?	7 (4.14)	162 (95.86)
At what age, it is right to introduce semi-solid foods into a child's diet? (We need to followed if she mentions 6 months)	36 (21.3)	133 (78.7)
What should we provide who suffers from diarrhea? (We followed if she mentions ORS a fluids)	32 (18.93)	137 (81.07)
What types of food should we consume every day? (We judged their knowledge based on the answer)	80 (47.34)	89 (52.66)
Do you think children should not regularly consume fast foods/industrial foods/ snacks (restaurants)?	146 (86.39)	23 (13.61)

After constructing the mothers' nutrition knowledge by summing up above six variables, the study found the average score of mothers' nutrition knowledge was 3.33. The maximum score was found 6 with a minimum of 1 with and a standard deviation of 1.033. The frequency distribution of the mothers' nutrition knowledge has been shown in Figure 1. This histogram has depicted a clearer distribution of nutrition knowledge score of RMG working mothers.

Figure 2. Frequency distribution of mothers' nutrition knowledge.

The mean age of the mothers was 25.59 years. Among all the mothers, 24% of them had no education. Highest portion of mothers (37%) belonged from up to primary level education, while the number of mothers in higher secondary and more educational level was lowest (8%). Among the study respondents, the elderly members were present only in 25% of the households. Mothers, working in the RMG factories did not sufficiently receive ANC services during their pregnancy. They did not have routine visits and only visited doctors when an emergency case arises and no one visited 4 and more times as recommended by WHO. Therefore, we have taken the variable as dichotomous (whether they received ANC or not). Here, those who have received for ANC during their pregnancy, have a better mean knowledge score of 3.47 than those who did not receive.

Though the workers stay remains outside of home for whole day, but their mobility may be restricted due to time shortage and cultural constraint. Among the respondent RMG workers, 61% of them have mobility in the market, hospitals, relatives' house, etc. and they have a higher mean knowledge score of 3.57 compared to those mothers who have restricted mobility. Among all the respondents, 72% of them have media access and they have a high mean value of 3.46. A few (15%) of the respondent mothers are members of any organization, but they have a lower mean value than those who are not engaged in that group.

Table 2. Mothers' nutrition knowledge by different variables (mean = on an average how many nutrition related questions that mothers have answered correctly).

Variables	Mean	Freq.	Percentage	Maximum	Minimum
Mothers' education					
No education	2.951	41	24.26	5	1
Up to primary	3.145	62	36.69	5	1
Up to secondary	3.660	53	31.36	6	2
Higher secondary and more	4.077	13	7.69	6	3
Total	3.331	169	100.00	6	1
Presence of elderly member					
No	3.302	126	74.56	5	1
Yes	3.419	43	25.44	6	1
Total	3.331	169	100.00	6	1
ANC					
Not received	2.409	22	13.02	5	1
Received	3.469	147	86.98	4	2
Total	3.331	169	100.00	6	1
Mobility of the participants					
No	2.955	66	39.05	6	1
Yes	3.573	103	60.95	6	1
Total	3.331	169	100.00	6	1
Exposure to media					
No	3.021	48	28.40	5	1
Yes	3.455	121	71.60	6	1
Total	3.331	169	100.00	6	1
Membership in any organization					
No	3.420	143	84.62	5	1
Yes	2.846	26	15.38	5	2
Total	3.331	169	100.00	5	1

Factors Affecting Nutritional Knowledge of Mothers Working in the RMG Industry

After exploring the nature of both dependent and explanatory variables, the study made inference on mothers' nutrition knowledge. Table 2 represents the regression result and to explain the result, Incident Rate Ratio (IRR) has been used.

Table 3. Factors affecting mothers' nutrition knowledge by Robust Poisson Regression (RPR).

Mothers' nutrition knowledge	IRR	Robust St. Err.	t-value	p-value	[95% Conf Interval]		Sig
Age of mother	1.001	.004	0.28	.778	.993	1.009	
Mothers' education (no education)							
Up to primary	.999	.07	-0.01	.99	.871	1.146	
Up to secondary	1.179	.08	2.42	.016	1.032	1.347	**
Higher secondary and more	1.296	.111	3.02	.003	1.095	1.534	***
Presence of elderly member (1= Yes, 0= No)	1.064	.059	1.13	.26	.955	1.186	
Antenatal care received	1.325	.157	2.38	.017	1.051	1.671	**
Mothers' mobility (1= Yes, 0= No)	1.173	.055	3.42	.001	1.07	1.285	***
Exposure to media (1= Yes, 0= No)	.994	.057	-0.10	.92	.888	1.113	
Membership in any organization (1= Yes, 0= No)	1.037	.082	-0.43	.667	.817	1.138	
Constant	2.15	.31	5.32	0	1.622	2.852	***
Mean dependent var		3.331	SD dependent var				1.033
Pseudo r-squared		0.025	Number of observations				169
Chi-square		45.735	Prob > chi2				0.000
Akaike crit. (AIC)		577.797	Bayesian crit. (BIC)				609.09

*** p<.01, ** p<.05, * p<.1

The estimated incident rate ratio comparing mothers who have "no education" to "up to secondary education", given the other variables are held constant in the model, are expected to have a rate of 1.179 times greater nutrition knowledge. Similarly comparing mothers having "no education" to "higher secondary and more" level of education is expected to have a rate of 1.296 times higher nutrition knowledge holding all other variables as fixed. A rate of 1.325 times greater nutrition knowledge has been found when comparing those mothers who "didn't receive ANC service" to "received ANC service" holding all the other predictors constant in the model. Another predictor, mothers' mobility has a rate of 1.173 times higher nutrition knowledge by keeping all the other explanatory variables fixed and comparing with mothers have no mobility to those mothers who have mobility.

Goodness of fit test

Deviance goodness-of-fit = 44.62916
Prob > chi^2(159)   = 1.0000
Pearson's goodness-of-fit = 43.08782
Prob > chi^2(159)   = 1.0000

An insignificant test statistic represents better fitted model and confirmed that the assumption of Poisson distribution is not violated.

Link test

Iteration 0: log likelihood = -278.19521
Iteration 1: log likelihood = -278.19493
Iteration 2: log likelihood = -278.19493
Poisson regression
Number of observation =   169
                    LR chi^2(2)   = 15.99
                    Prob > chi^2 = 0.0003
Log likelihood = -278.19493   Pseudo R^2 = 0.0279

Table 4. Link test for model specification.

Know _sc2	Coefficient	Std. errs.	z	P>z	[95% conf. interval]	
_hat	4.469	2.985	1.500	0.134	-1.382	10.320
_hatsq	-1.499	1.283	-1.170	0.242	-4.014	1.015
_cons	-1.966	1.722	-1.140	0.254	-5.340	1.409

The z-test for hat square is now insignificant, indicating that the model is correctly specified

Discussion

The study found that there is a strong positive relationship between mothers' education and their nutritional knowledge. When a mother is educated, she is aware and conscious of everything that is happening around her. The more a person is educated, the more she becomes passion to learn. Actually, the first and foremost purpose of education is to gain knowledge. The educated people can read the billboard, books, newspapers, magazines, can understand signs and symbols where the nutrition messages lies and to write anywhere, they wish to communicate like doctors and health workers to know the information. Sharma (2018) mentioned that education helps anyone to read signboards in the street, at shops, and the usual places, where they are going. It also removes the cultural superstition from anyone's mind. Another issue is: there is nutrition chapter in the 'science' book of high school and upper-level classes which is compulsory for the students to pass the examination. In those aspects, a mother's educational qualification may lead her to learn about nutrition. Several studies also showed that mothers' education translates into maternal nutritional knowledge (Gibson *et al.*, 1998; Webb and Block, 2004; Burchi, 2010).

In the current research, mothers' mobility (to go to hospital, relatives house, community meeting and market) has been found a significant predictor variable that affects mother's nutrition knowledge. Opportunity to go outside form home may enable a woman to take several advantages for improving herself. In addition, working women get attach to

the outside world continuously knowing their surroundings, finding more ways to upgrade her quality and standard of life. That means they get autonomy in their personal life, household decision, resource use, physical and financial mobility, and achieve a dignity in the community she belonging. Hackett *et al*., (2015) mentioned that club activities provided adolescent girls with education about various aspects of adulthood, as well as an opportunity to socialize and interact with other girls their age. It has been found in this study that when RMG workers get some free time, they visit friends, relatives and neighbors with their child. At that time, they discuss about their child health which, to some extent, may increase their nutritional knowledge. In this way, mother's mobility may improve their nutritional knowledge. Health and nutrition issues are also sometimes discussed in the community events and the mothers may receive constructive suggestions. RMG workers greater mobility to different places may improve their social networks. Greater communication can lead to greater flow of information (Kumar *et al*., 2019). Therefore, mothers with greater mobility may achieve more nutrition knowledge.

The study also found that ante-natal care has a positive impact on a mothers' nutrition knowledge which may also play a significant role in ensuring safe motherhood. Through antenatal care, a mother gets an opportunity to receive the benefits of skilled attendance at birth and to encourage women to seek postpartum care for themselves and their newborns. It is also an ideal time to counsel women about the child health as well as their own (Akhtar *et al*., 2018). It could be mentioned here that Bangladeshi women who work in the garment industry rarely have access to ante-natal care through an onsite health facility (Hossain *et al*., 2017). Alam *et al*., (2018) found that in reality, mothers do not visit the doctors due to different reasons: fear of losing the job, time constraint etc. Jo *et al*., (2019) mentioned that nearly three in four mothers in Bangladesh do not receive 4 or more ANC visits. While receiving ante-natal care, the future mothers (and sometimes her husband) receive information about health guidelines to be maintained during the pregnancy, child development, what to expect, how to provide the greatest care for the child immediately after birth etc. Akhtar *et al*., (2018) and Devkota *et al*., (2017) found that counseling had a positive impact on the knowledge, attitude and practice of pregnant women towards medication. During pregnancy, women receiving antenatal care pointed to the importance of eating a balanced diet of protein, vegetables, fruits, and milk. ANC is very important for the mothers because they do not have the opportunity to learn as a way they had learnt at school. Again, when they had read their 'Nutrition' chapter in their school life, they were the adolescents and remained dependent on their parents for food and care, though they read, most of them did not realize. Again considering cultural constraint and time limitation, the workers living in urban areas may not get time to discuss and share the problems with their friends and relatives. Therefore, antenatal visits would be the best option for the workers to fill up the knowledge gaps, when they feel problems and get the solution. But if the factory management is not mother-friendly, they may not get the opportunity to visit doctors. It was found that many workers do not express the information about their pregnancy due to fear of losing job. As the RMG workers have less opportunity in their life to learn about nutrition, therefore the factory owners may need to concentrate on their reproductive health matters.

Conclusion & Policy Implications

This study is an effort to measure what factors would enhance the nutrition knowledge of mothers working in the RMG sector. RMG workers probably work for the longest hours than any other professionals at their workplace. At the time of childhood, they failed to achieve educational attainment because of lack of financial ability, poor nutrition and poor health; and in their adult life, lack of resources and poor networking do not allow them to earn knowledge. Most of them have early marriage. They lack antenatal care services and freedom of movement. Due to lack of time, money and awareness, they do not visit hospital and healthcare centers. They rarely have the opportunity of learning from different sources like watching TV, reading newspapers, chatting with friends, speaking with anyone educated/superiors and many others. As the workers do have very less opportunity to learn by themselves due to different mentioned reasons, therefore we need to ensure women-friendly work place for the RMG workers. Though there is a provision for doctors in the factory, but it seems the workers rarely visit them. As the RMG sector deals with the women with reproductive ages, the relevant authorities need to think about their welfare issues and address to fulfill the basic needs of the workers including the health issue of their family members at present and in the future. The awareness programme may be the least cost options for them. From time to time, the factory owners may regularly arrange 'nutrition counseling' and/or 'discussion session' with the help of health professionals to enhance the knowledge of the workers. The ministry of labour may guide the factory owners to consider about antenatal care. Otherwise, the nation would face malnutrition burden with their family members especially with the children.

Author's Contribution: SH, MS, DAAR, MNH designed the study; Except SH, DAAR, MNH everyone was involved with data collection; MS did the analysis; Every one of the team contributed to write the manuscript; SH, MNH supervised the whole work; SH, MS, DAAR, FTZH completed proofreading. All authors read and approved the final manuscript.

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